We claim:

1. A method for analyzing a sports video sequence, the method comprising:

(a) detecting a dominant color region in the video sequence;

(b) detecting boundaries of shots in the video sequence in accordance with color data in the video sequence;

(c) classifying at least one of the shots whose boundaries have been detected in step (b) through spatial composition of the dominant color region;

(d) detecting at least one of a goal event, a person and a location in the video sequence; and

(e) analyzing and summarizing the sports video sequence in accordance with a result of step (d).

2. The method of claim 1, wherein step (a) is performed with respect to a plurality of color spaces.

3. The method of claim 1, wherein step (a) comprises:

(i) determining a peak of each color component;

(ii) determining an interval around each peak determined in step (a)(i);

(iii) determining a mean color in each interval determined in step (a)(ii); and

(iv) classifying each pixel in the video sequence as belonging to the dominant color region or as not belonging to the dominant color region in accordance to the mean color in each interval determined in step (a)(iii).

4. The method of claim 3, wherein step (a)(iv) comprises determining a distance in color space between each pixel and the mean color.

5. The method of claim 3, wherein step (a) is performed a plurality of times through the video sequence.

6. The method of claim 1, wherein step (b) comprises determining whether a first frame and a second frame are in a same shot or in different shots by:

(i) determining, for each of the first frame and the second frame, a ratio of pixels in the dominant color region to all pixels;

(ii) determining a difference between the ratio determined for the first frame and the ratio determined for the second frame; and

(iii) comparing the difference determined in step (b)(ii) to a first threshold value.

7. The method of claim 6, wherein step (b) further comprises:

(iv) computing a histogram intersection for the first frame and the second frame;

(v) computing a difference in color histogram similarity for the first frame and the second frame in accordance with the histogram intersection; and

(vi) comparing the difference in color histogram similarity to a second threshold value

8. The method of claim 7, wherein the second threshold value is selected in accordance with a type of shot whose boundaries are to be detected.

9. The method of claim 1, wherein step (c) comprises:

(i) calculating a ratio of a number of pixels in the dominant color region to a total number of pixels; and

(ii) if the ratio calculated in step (c)(i) is not above a threshold value, classifying the shot in accordance with the ratio.

10. The method of claim 9, wherein step (c) further comprises:

(iii) if the ratio calculated in step (c)(i) is above the threshold value, performing the spatial composition on the dominant color region and using the spatial composition to classify the shot.

11. The method of claim 1, wherein step (d) comprises detecting the goal event in accordance with a template of characteristics which the goal event, if present, will satisfy.

12. The method of claim 11, wherein the template is applied starting with detection of a slow-motion replay.

13. The method of claim 12, wherein long shots are detected to define a beginning and an end of a break in which the goal, if present, will be shown.

14. The method of claim 13, wherein the template comprises an indication of all of: a duration of the break, an occurrence of at least one close-up or out-of-field shot, and an occurrence of at least one slow-motion replay shot.

15. The method of claim 1, wherein step (d) comprises detecting a referee by detecting a uniform color associated with the referee.

16. The method of claim 15, wherein step (d) further comprises forming horizontal and vertical projections of a region having the uniform color and determining from the horizontal and vertical projections whether the region corresponds to the referee.

17. The method of claim 1, wherein step (d) comprises detecting a penalty box.

18. The method of claim 17, wherein the penalty box is determined by:

(i) forming a mask region in accordance with the dominant color region;

(ii) within the mask region, detecting lines by edge response; and

(iii) from the lines detected in step (d)(ii), locating the penalty box by applying size, distance and parallelism constraints to the lines.

19. The method of claim 1, wherein the sports video sequence shows a soccer game.

20. The method of claim 1, wherein step (e) comprises performing video compression on the sports video sequence.

21. The method of claim 20, wherein the video compression comprises adjusting a bit allocation for each shot in accordance with a result of step (c).

22. The method of claim 20, wherein the video compression comprises adjusting a frame rate for each shot in accordance with a result of step (c).

23. The method of claim 22, wherein the video compression further comprises adjusting a bit allocation for each shot in accordance with a result of step (c).

24. A system for analyzing a sports video sequence, the system comprising:

an input for receiving the video sequence;

a computing device, in communication with the input, for:

(a) detecting a dominant color region in the video sequence;

(b) detecting boundaries of shots in the video sequence in accordance with color data in the video sequence;

(c) classifying at least one of the shots whose boundaries have been detected in step (b) through spatial composition of the dominant color region;

(d) detecting at least one of a goal event, a person and a location in the video sequence; and

(e) analyzing and summarizing the sports video sequence in accordance with a result of step (d); and

an output, in communication with the computing device, for outputting a result of step (e).

25. The system of claim 24, wherein the computing device performs step (a) with respect to a plurality of color spaces.

26. The system of claim 24, wherein the computing device performs step (a) by:

(i) determining a peak of each color component;

(ii) determining an interval around each peak determined in step (a)(i);

(iii) determining a mean color in each interval determined in step (a)(ii); and

(iv) classifying each pixel in the video sequence as belonging to the dominant color region or as not belonging to the dominant color region in accordance to the mean color in each interval determined in step (a)(iii).

27. The system of claim 26, wherein the computing device performs step (a)(iv) by determining a distance in color space between each pixel and the mean color.

28. The system of claim 24, wherein the computing device performs step (a) a plurality of times through the video sequence.

29. The system of claim 24, wherein the computing device performs step (b) by determining whether a first frame and a second frame are in a same shot or in different shots by:

(i) determining, for each of the first frame and the second frame, a ratio of pixels in the dominant color region to all pixels;

(ii) determining a difference between the ratio determined for the first frame and the ratio determined for the second frame; and

(iii) comparing the difference determined in step (b)(ii) to a first threshold value.

30. The system of claim 28, wherein the computing device performs step (b) further by:

(iv) computing a histogram intersection for the first frame and the second frame;

(v) computing a difference in color histogram similarity for the first frame and the second frame in accordance with the histogram intersection; and

(vi) comparing the difference in color histogram similarity to a second threshold value

31. The system of claim 30, wherein the second threshold value is selected in accordance with a type of shot whose boundaries are to be detected.

32. The system of claim 24, wherein the computing device performs step (c) by:

(i) calculating a ratio of a number of pixels in the dominant color region to a total number of pixels; and

(ii) if the ratio calculated in step (c)(i) is not above a threshold value, classifying the shot in accordance with the ratio.

33. The system of claim 32, wherein the computing device performs step (c) further by:

(iii) if the ratio calculated in step (c)(i) is above the threshold value, performing the spatial composition on the dominant color region and using the spatial composition to classify the shot.

34. The system of claim 24, wherein the computing device performs step (d) by detecting the goal event in accordance with a template of characteristics which the goal event, if present, will satisfy.

35. The system of claim 34, wherein the template is applied starting with detection of a slow-motion replay.

36. The system of claim 35, wherein long shots are detected to define a beginning and an end of a break in which the goal, if present, will be shown.

37. The system of claim 34, wherein the template comprises an indication of at least one of: a duration of the break, an occurrence of at least one close-up or out-of-field shot, and an occurrence of at least one slow-motion replay shot.

38. The system of claim 24, wherein the computing device performs step (d) by detecting a referee by detecting a uniform color associated with the referee.

39. The system of claim 38, wherein the computing device performs step (d) further by forming horizontal and vertical projections of a region having the uniform color and determining from the horizontal and vertical projections whether the region corresponds to the referee.

40. The system of claim 24, wherein the computing device performs step (d) by detecting a penalty box.

41. The system of claim 40, wherein the penalty box is determined by:

(i) forming a mask region in accordance with the dominant color region;

(ii) within the mask region, detecting lines by edge response; and

(iii) from the lines detected in step (d)(ii), locating the penalty box by applying size, distance and parallelism constraints to the lines.

42. The system of claim 24, wherein the computing device performs step (e) by performing video compression on the sports video sequence.

43. The system of claim 42, wherein the video compression comprises adjusting a bit allocation for each shot in accordance with a result of step (c).

44. The system of claim 42, wherein the video compression comprises adjusting a frame rate for each shot in accordance with a result of step (c).

45. The system of claim 44, wherein the video compression further comprises adjusting a bit allocation for each shot in accordance with a result of step (c).

46. A method for compressing a sports video sequence, the method comprising:

(a) classifying a plurality of shots in the sports video sequence;

(b) adjusting at least one of a bit allocation and a frame rate for each of the shots in accordance with a result of step (a); and

(c) compressing the sports video sequence in accordance with a result of step (b).

47. The method of claim 46, wherein:

step (a) comprises classifying the plurality of shots as long shots, medium shots or other shots; and

step (b) comprises assigning a maximum bit allocation or frame rate to the long shots, a medium bit allocation or frame rate to the medium shots and a minimum bit allocation or frame rate to the other shots.

48. A system for compressing a sports video sequence, the system comprising:

an input for receiving the sports video sequence;

a computing device, in communication with the input, for:

(a) classifying a plurality of shots in the sports video sequence;

(b) adjusting at least one of a bit allocation and a frame rate for each of the shots in accordance with a result of step (a); and

(c) compressing the sports video sequence in accordance with a result of step (b); and

an output, in communication with the computing device, for outputting a result of step (c).

49. The system of claim 48, wherein the computing device performs step (a) by classifying the plurality of shots as long shots, medium shots or other shots, and wherein the computing device performs step (b) by assigning a maximum bit allocation or frame rate to the long shots, a medium bit allocation or frame rate to the medium shots and a minimum bit allocation or frame rate to the other shots.